## CLAIMS

1. A method of automatically prescribing radial slice planes for magnetic resonance imaging ("MRI") along a long-axis of a target, comprising:

acquiring vectorial components for a short-axis slice of the target;

establishing vectorial components for a long-axis slice using the vectorial components of the short-axis slice; and

defining a plurality of long-axis slice planes positioned relative to the long axis slice, each of the slices being rotated about a long axis in a direction of a long-axis frequency encoding vector.

2. The method of claim 1, further comprising obtaining a short-axis image along the short-axis slice, wherein the obtaining step comprises extracting the vectorial components from the short-axis image.

3. The method of claim 1, wherein the acquiring step comprises acquiring a slice selection vector, a phase encoding vector, and a frequency encoding vector for the short-axis slice.

4. The method of claim 1, wherein the establishing step comprises transposing the short-axis vectorial components.

5. The method of claim 1, wherein the establishing step long-axis vectorial components comprises transposing frequency encoding and slice selection components of the short-axis slices.

6. The method of claim 1, wherein the establishing step includes determining long-axis vectorial components by:

defining a long-axis frequency encoding vector ($\vec{R}_0$) as a short-axis slice selection vector ($\vec{R}_0 = \vec{S}'$);

defining a long-axis slice selection vector ($\vec{S}_0$) as a short-axis frequency encoding vector ($\vec{S}_0 = \vec{R}'$); and

defining a long-axis phase-encoding vector ($\vec{P}_0$) as a short-axis phase-encoding vector ($\vec{P}_0 = \vec{P}'$).

7. The method of claim 1, wherein the defining step comprises defining a plurality of long-axis slice-planes rotating about a frequency-encoding direction.

8. The method of claim 1, wherein the defining step comprises:

defining a phase-encoding vector ($\vec{P}_i$) for each ($i$) of the plurality ($n$) of long-axis slice planes as $\vec{P}_i = \vec{P}_0 \cos\left(180 \times \frac{i}{n}\right) + \vec{S}_o \sin\left(180 \times \frac{i}{n}\right)$;

defining a slice-selection vector ($\vec{S}_i$) for each ($i$) of the plurality ($n$) of long-axis slice planes as $\vec{S}_i = \vec{S}_0 \cos\left(180 \times \frac{i}{n}\right) - \vec{P}_o \sin\left(180 \times \frac{i}{n}\right)$; and

defining a frequency encoding vector ($\vec{R}_i$) for each ($i$) of the plurality ($n$) of long-axis slice planes as $\vec{R}_i = \vec{R}_o$.

9. The method of claim 1, further comprising modifying an RF transmitter and receiver frequency and phase to accommodate the defined long-axis slices.

10. The method of claim 9, wherein the modifying step comprises applying frequency and phase shifts to signals associated with each of the plurality of long-axis planes.

11. The method of claim 1, further comprising:

modifying an RF transmitter and receiver frequency by a slice select shift ($fs_i$) for each ($i$) long-axis plane, wherein the slice select shift is defined by

$fs_i = \gamma \cdot G_s \cdot \vec{X}_i \bullet \vec{S}_i$, wherein $G_s$ is a slice-select gradient amplitude, and $\gamma$ is a gyromagnetic ratio;

12. The method of claim 1, further comprising;

modifying an RF transmitter and receiver frequency by a readout shift ( $fr_i$ ) for each ($i$) long-axis plane, wherein the readout shift is defined by $fr_i = \gamma \cdot G_r \cdot \vec{X}_i \bullet \vec{R}_i$, wherein $G_r$ is a readout gradient amplitude.

13. The method of claim 1, further comprising modifying the phase-encode direction for each ($i$) long-axis plane, wherein the phase-encode shift ( $ps_i$ ) is defined by $ps_i = \frac{360.0}{PFOV} \vec{X}_i \bullet \vec{P}_i$, wherein PFOV is a phase field-of-view and $\vec{X}_i$ is a position vector for the $i^{th}$ long-axis slice plane.

14. A magnetic resonance imaging ("MRI") apparatus, comprising:

a processor that is capable of executing instructions to automatically prescribe a radial along a long-axis of a target, wherein the processor is capable of;

establishing vectorial components for a long-axis slice of a target using vectorial components of a short-axis slice of the target,

defining a plurality of long-axis slice planes positioned relative to the long-axis slice, each of the slices being rotated about a long axis in a direction of a long-axis frequency encoding vector, and

determining a frequency shift for the long-axis slices;

an RF transmitter in communication with the processor, wherein the transmitter forwards an RF pulse toward the target in response to a signal provided by the processor to obtain an image at each of the plurality of long-axis slice planes; and

an RF receiver in communication with the processor, wherein the RF receiver is capable of receiving data from echoes generated by the pulses, and transmits the data to the processor.

15. The apparatus of claim 14, wherein the processor controls the RF pulse generated by the RF transmitter using the frequency shift.

16. The apparatus of claim 14, wherein the processor processes data received by the RF receiver using the frequency shift.

17. The apparatus of claim 14, wherein the a frequency shift is calculated by calculating a slice selection frequency shift and a readout frequency shift for each of the plurality of long-axis slice planes.

18. The apparatus of claim 14, wherein the phase shift is calculated for each of the long-axis planes.

19. A computer-readable medium having stored thereon computer-executable instructions for automatically prescribing radial slice planes for magnetic resonance imaging ("MRI") along a long-axis of a target, wherein the instructions configure a processor arrangement to perform the steps comprising:

establishing vectorial components for a long-axis slice using vectorial components for a short-axis slice of the target; and

defining a plurality of long-axis slice planes positioned relative to the long axis slice, each of the long-axis slices rotating about a long axis in a direction of a long-axis frequency encoding vector, and being positioned at substantially equal angles relative to adjacent slices.

20. The medium of claim 19, wherein vectorial components are the established by;

establishing slice selection and frequency-encoding vectorial components for the long-axis slice by transposing slice selection and frequency-encoding vectorial components of the short-axis slice; and

establishing a phase-encoding vectorial component of the long-axis slice as the phase-encoding vectorial component of the short-axis slice.

21. The medium of claim 19, further comprising further executable instructions which adapt the processing arrangement to calculate a readout frequency shift, a slice selection frequency shift, and a phase shift for each of the long-axis slice planes.

22. A software arrangement, which when executed by a processing arrangement is capable of automatically prescribing radial slice planes for magnetic resonance imaging ("MRI") along a long-axis of a target, comprising:

a first set of instructions which configure the processing arrangement to establish vectorial components for a long-axis slice using vectorial components for a short-axis slice of the target; and

a second set of instructions which configure the processing arrangement to define a plurality of long-axis slice planes positioned relative to the long axis slice, each of the long-axis slices rotating about a long axis in a direction of a long-axis frequency encoding vector, and being positioned at substantially equal angles relative to adjacent slices.